CLAIMS

1. An ion generating element comprising at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are arranged both on a same flat surface of the base member but separately from and independently of each other on a diagonal line of the flat surface.

2. An ion generating element comprising at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first discharger has a first discharging portion for causing electric discharge and a first conducting portion surrounding a perimeter or part of the first discharging portion and kept at an equal potential with the first discharging portion,

wherein the second discharger, which generates negative ions, has a second discharging portion for causing electric discharge and a second conducting portion surrounding a perimeter or part of the second discharging portion and kept at an equal potential with the second discharging portion, and

wherein the first and second dischargers are arranged both on a same flat surface of the base member but separately from and independently of each other in such a way that the first and second conducting portions face each other or separately from and independently of each other on a diagonal line of the flat surface.

3. An ion generating element comprising at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other.

4. The ion generating element according to claim 3,

wherein the first and second dischargers are arranged in such a way that the first and second discharge electrodes are located at a predetermined distance from each other.

5. The ion generating element according to claim 3 or 4,

wherein the first and second dischargers are arranged both on the same flat surface of the base member but separately from and independently of each other on a diagonal line of the flat surface.

6. The ion generating element according to claim 3 or 4,

wherein the first discharger has a first discharging portion for causing electric discharge and a first conducting portion surrounding a perimeter or part of the first discharging portion and kept at an equal potential with the first discharging portion,

wherein the second discharger, which generates negative ions, has a second discharging portion for causing electric discharge and a second conducting portion

surrounding a perimeter or part of the second discharging portion and kept at an equal potential with the second discharging portion, and

wherein the first and second dischargers are arranged both on a same flat surface of the base member but separately from and independently of each other in such a way that the first and second conducting portions face each other.

7. An ion generating apparatus comprising:

an ion generating element; and

a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit generates positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage, and generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage.

8. An ion generating apparatus comprising:

an ion generating element; and

a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit comprises:

a first voltage application portion and a switching portion whose operation can be switched between a mode in which they generate positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage and a mode in which they generate negative ions by applying to the first discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage; and

a second voltage application portion that generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage,

wherein operation can be switched between a mode in which approximately equal quantities of positive and negative ions are generated and a mode in which only negative ions are generated.

9. An ion generating apparatus comprising:

an ion generating element; and

a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit comprises:

a third voltage application portion and a bias switching portion whose operation can be switched between a mode in which they generate positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage and a mode in which they generate positive and negative ions by applying to the first discharger of the ion generating element a non-biased voltage waveform of the alternating-current impulse voltage; and

a second voltage application portion that generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage,

wherein operation can be switched between a mode in which approximately equal quantities of positive and negative ions are generated and a mode in which a large quantity of

negative ions relative to a quantity of positive ions are generated.

10. The ion generating apparatus according to one of claims 7 to 9,

wherein the alternating-current impulse voltage applied to the first discharger is an alternating voltage waveform such that the voltage at the first induction electrode relative to the first discharging electrode starts with a positive polarity, and

wherein the alternating-current impulse voltage applied to the second discharger is an alternating voltage waveform such that the voltage at the second induction electrode relative to the second discharging electrode starts with a negative polarity

11. The ion generating apparatus according to claim 7 or 9,

wherein the voltage application circuit includes:

a first diode that has a cathode thereof connected to a reference potential and has an anode thereof connected to the second discharging electrode; and

a second diode that, when the first discharger generates positive ions, has an anode thereof connected to the reference potential and has a cathode thereof connected to the first discharging electrode.

12. The ion generating apparatus according to claim 8,

wherein the voltage application circuit includes:

a first diode that has a cathode thereof connected to a reference potential and has an anode thereof connected to the second discharging electrode;

a second diode that, when the first discharger generates positive ions, has an anode thereof connected to the reference potential and has a cathode thereof connected to the first

discharging electrode; and

a third diode that, when the first discharger generates negative ions, has a cathode thereof connected to the reference potential and has an anode thereof connected to the first discharging electrode.

13. The ion generating apparatus according to one of claims 7 to 9,

wherein the voltage application circuit includes a first transformer having a primary coil that is driven, a first secondary coil from which the alternating-current impulse voltage is applied to the first discharger, and a second secondary coil from which the alternating-current impulse voltage is applied to the second discharger, and

wherein the first and second secondary coils of the first transformer are arranged on both sides of the primary coil.

14. The ion generating apparatus according to one of claims 7 to 9,

wherein the voltage application circuit includes:

a second transformer having a primary coil that is driven and a secondary coil from which the alternating-current impulse voltage is applied to the first discharger; and

a third transformer having a primary coil that is driven and a secondary coil from which the alternating-current impulse voltage is applied to the second discharger,

wherein the secondary coil of the second transformer, the primary coil of the second transformer, the primary coil of the third transformer, and the secondary coil of the third transformer are arranged in this order.

15. The ion generating apparatus according to claim 14,

wherein the primary coil of the second transformer and the primary coil of the third transformer are connected in parallel.

16. The ion generating apparatus according to claim 14,

wherein the primary coil of the second transformer and the primary coil of the third transformer are connected in series.

17. The ion generating apparatus according to claim 16,

wherein a flywheel diode is connected to each of the primary coil of the second transformer and the primary coil of the third transformer.

18. An electric appliance comprising:

an ion generating apparatus; and

a releaser for discharging ions generated by the ion generating apparatus into air,

wherein the ion generating apparatus comprises an ion generating element and a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit generates positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage, and generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage.

19. An electric appliance comprising:

an ion generating apparatus; and

a releaser for discharging ions generated by the ion generating apparatus into air,

wherein the ion generating apparatus comprises an ion generating element and a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit comprises:

a first voltage application portion and a switching portion whose operation can be switched between a mode in which they generate positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage and a mode in which they generate negative ions by

applying to the first discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage; and

a second voltage application portion that generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage,

wherein operation can be switched between a mode in which approximately equal quantities of positive and negative ions are generated and a mode in which only negative ions are generated.

20. An electric appliance comprising:

an ion generating apparatus; and

a releaser for discharging ions generated by the ion generating apparatus into air,

wherein the ion generating apparatus comprises an ion generating element and a voltage application circuit connected to the ion generating element,

wherein the ion generating element comprises at least one first discharger for generating positive ions and at least one second discharger for generating negative ions, the first and second dischargers being both fitted or printed on a single base member,

wherein the first and second dischargers are each composed of a pair of a first or second discharging electrode, respectively, formed on a surface of a dielectric member serving as the base member and a first or second induction electrode, respectively, buried in the dielectric member, and are arranged both on a same flat surface of the base member but separately from and independently of each other, and

wherein the voltage application circuit comprises:

a third voltage application portion and a bias switching portion whose operation can

be switched between a mode in which they generate positive ions by applying to the first discharger of the ion generating element a voltage waveform obtained by positively biasing an alternating-current impulse voltage and a mode in which they generate positive and negative ions by applying to the first discharger of the ion generating element a non-biased voltage waveform of the alternating-current impulse voltage; and

a second voltage application portion that generates negative ions by applying to the second discharger of the ion generating element a voltage waveform obtained by negatively biasing the alternating-current impulse voltage,

wherein operation can be switched between a mode in which approximately equal quantities of positive and negative ions are generated and a mode in which a large quantity of negative ions relative to a quantity of positive ions are generated.

21. The electric appliance according to one of claims 18 to 20,

wherein the positive ions are $H^+(H_2O)_m$ and the negative ions are $O_2^-(H_2O)_n$ (where m and n are natural numbers).